WANS
World Academy of Nursing Science

Thailand Nursing and Midwifery Council

Thai Nurses' Association Of Thailand

The 2nd International Nursing Research Conference
"Future Nursing Research and Innovation for Sustainable Global Health"

to Commemorate the 125th Anniversary of the Birth of HRH Princess Srinagarindra

Jointly Organised by WANS, TNMC & NAT

Advancing Precision Health Through Nursing Innovation and Policy

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Editor-In-Chief The Journal of Transcultural Nursing
Executive Editor-In-Chief Women and Children Nursing

Conflicts of Interest

- No actual or potential conflicts of interest.
- No relationships with companies that manufacture medical devices, pharmaceuticals, biologics, or other companies producing FDA-regulated products.

Objectives

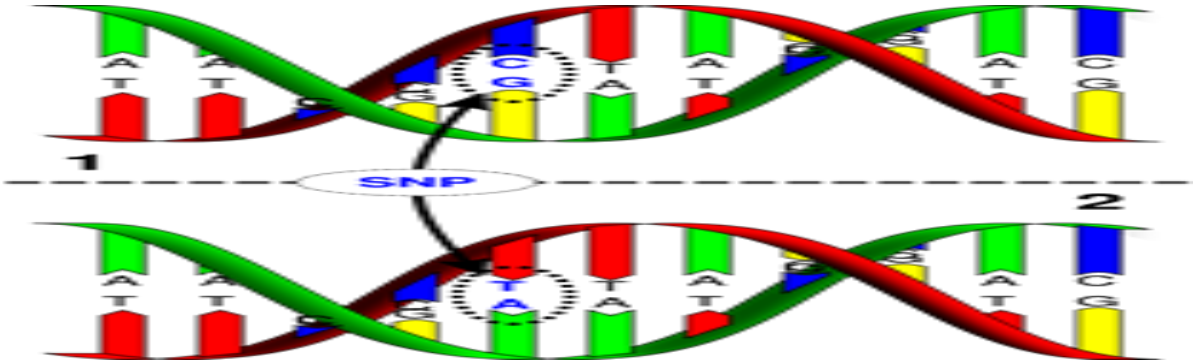
- Define precision health (PH) and state the importance of engaging the nursing profession for its effective clinical implementation.
- Identify methodologic tools and scientific advancements that are necessary to implement precision health into clinical settings.
- Summarize key nursing activities that are instrumental for advancing precision health.
- Identify key recommendations for nurse leaders in research, education, clinical practice, nursing administration and healthy policy settings to use in advancing precision health.

ANA, *American Nurse*

Human Genome Project Research Era
1990-2003

- Genome: totality of an organism's DNA
- Sequencing: process to determine order of bases in DNA.
- International government project: ahead of schedule & under budget

Genomic Variation
Single Nucleotide Polymorphism (SNP)



- DNA sequence variations that occur when a single nucleotide (A, T, C, or G) in the genome sequence is altered.

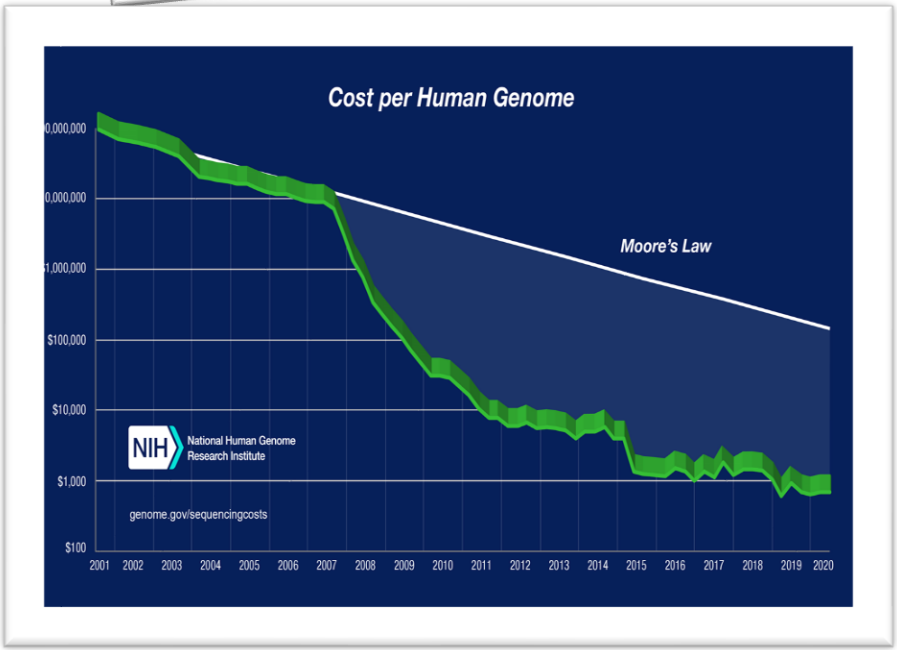
- ✓ **Predict response to therapy**
- ✓ **Identify genes for complex disease**

Ostrander, E. (2007) *Science 316*, 112.

http://www.dnabaser.com/articles/SNP/SNP-Single-nucleotide-polymorphism.png

Drivers of Precision Health

- Decreasing genomic sequencing costs.
- *Moore's Law*, yielding feasibility of increased genetic test (GT) availability and use;
- Big Data: Increased bio-informatics and computational (cloud) capacities for large amounts of data w/increased complexity and architecture (data dimensionality);
- Artificial Intelligence (AI) and Machine Learning (ML)



Precision Medicine

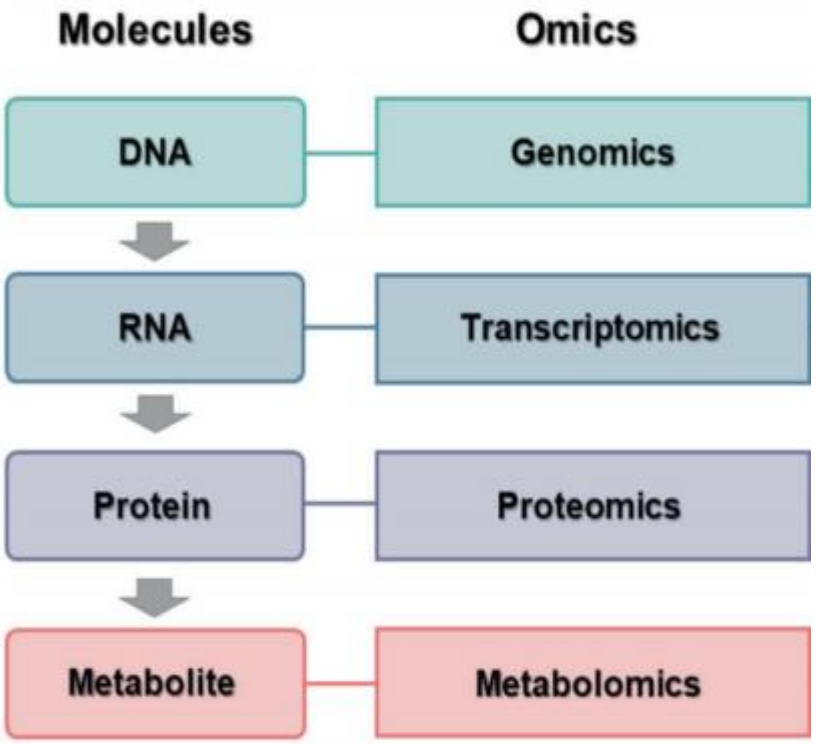
Precision medicine aims at discovering the right treatment, for the right patient, at the right time, by taking into account individual's genomic variability, environment, and lifestyle.

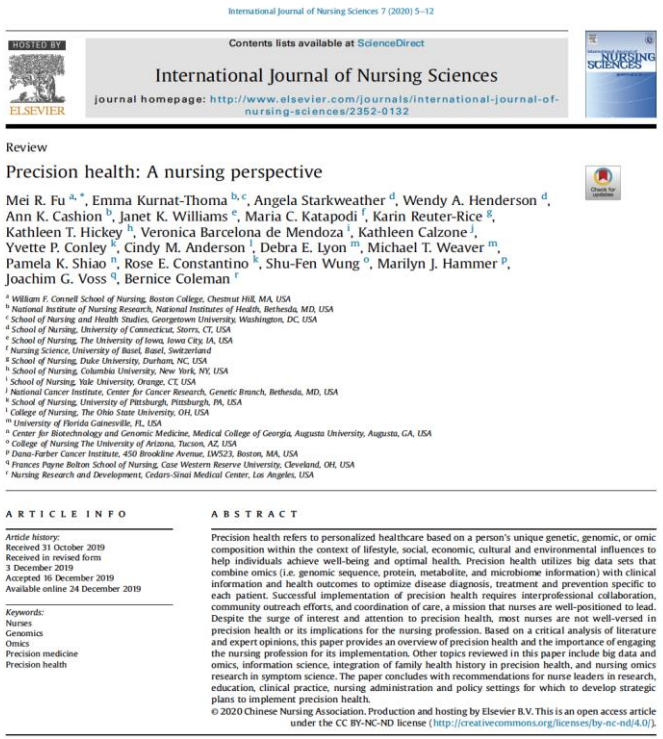
So the Precision Medicine Initiative we're launching today will lay the foundation for a new generation of lifesaving discoveries.

--President Barack Obama
State of the Union Address,
January 20, 2015

Precision Health

Personalized healthcare based on a person's unique genetic, genomic, or omic composition within the context of lifestyle, social, economic, cultural and environmental influences to help individuals achieve well-being and optimal health.





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Review

Precision health: A nursing perspective

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ABSTRACT

Precision health refers to personalized healthcare based on a person's unique genetic, genomic, or omic composition within the context of lifestyle, social, economic, cultural and environmental influences to help individuals achieve well-being and optimal health. Precision health utilizes big data sets that combine omics (i.e. genomic sequence, protein, metabolite, and microbiome information) with clinical information and health outcomes to optimize disease diagnosis, treatment and prevention specific to each patient. Successful implementation of precision health requires interprofessional collaboration, community outreach efforts, and coordination of care, a mission that nurses are well-positioned to lead. Despite the surge of interest and attention to precision health, most nurses are not well-versed in precision health or its implications for the nursing profession. Based on a critical analysis of literature and expert opinions, this paper provides an overview of precision health and the importance of engaging the nursing profession for its implementation. Other topics reviewed in this paper include big data and omics, information science, integration of family health history in precision health, and nursing omics research in symptom science. The paper concludes with recommendations for nurse leaders in research, education, clinical practice, nursing administration and policy settings for which to develop strategic plans to implement precision health.

Importance of Precision Health to Nursing

Current PH Applications

- Pharmacogenomics
- Oncology and Precision Diagnostics, Therapeutics
- Prenatal Screening and Maternal/Fetal Health; Newborn Screening
- Single Gene Disorders
- High-risk and Multifactorial Diseases w/strong Family History (FH) contributions
  - T2 Diabetes, heart disease, obesity, mental health, neurodegenerative

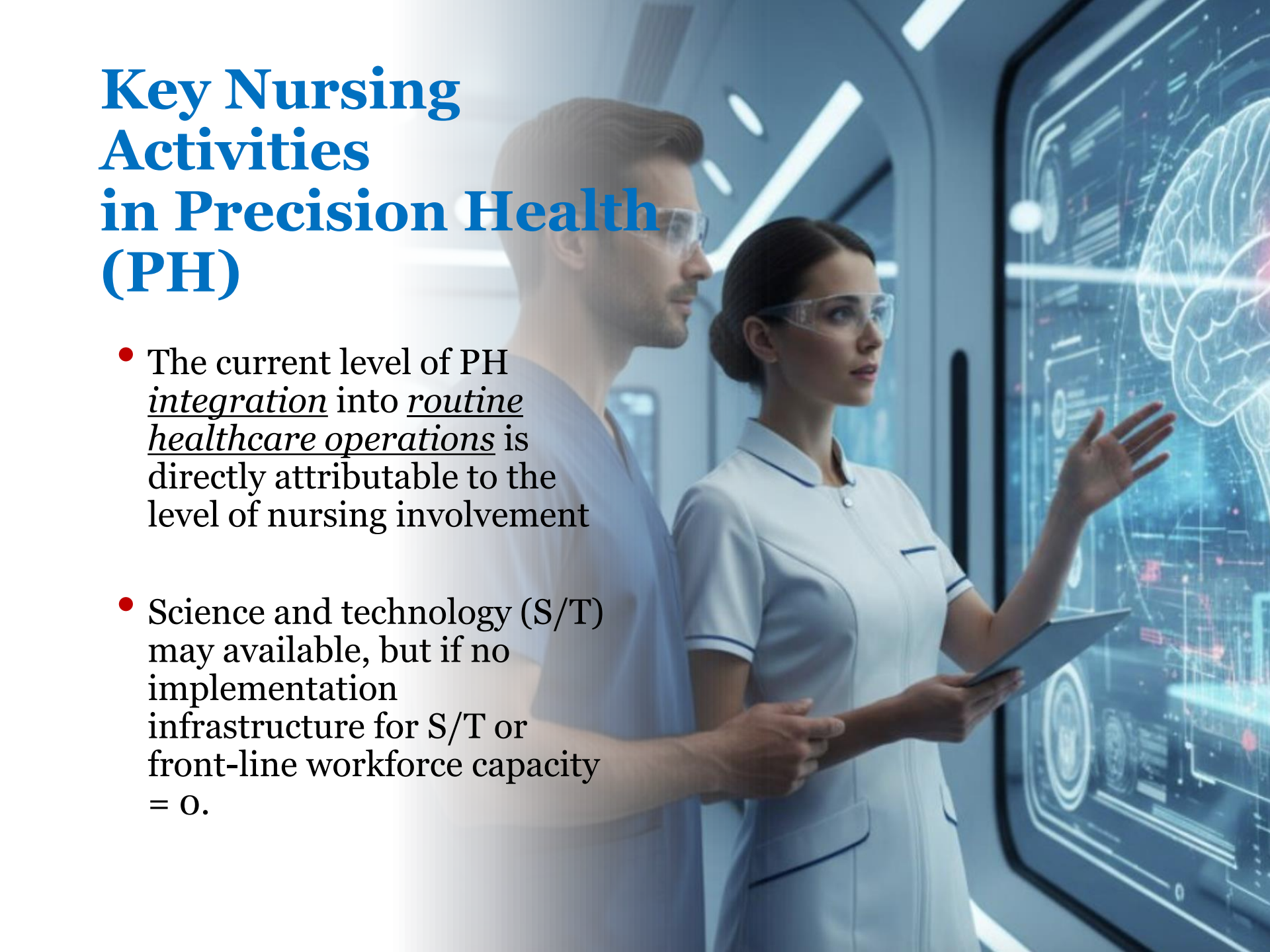
Precision Medicine

Precision medicine aims at discovering the right treatment, for the right patient, at the right time, by taking into account individual's genomic variability, environment, and lifestyle.

So the Precision Medicine Initiative we're launching today will lay the foundation for a new generation of lifesaving discoveries.
--President Barack Obama
State of the Union Address,
January 20, 2015

Table of Pharmacogenetic Associations | FDA

Key Nursing Activities in Precision Health (PH)



- The current level of PH *integration* into *routine healthcare operations* is directly attributable to the level of nursing involvement

- Science and technology (S/T) may available, but if no implementation infrastructure for S/T or front-line workforce capacity = 0.

Nurses are critical to the Success of Precision Medicine and Precision Health

- **Administering prescribed treatments and medications to patients based on their genotype and/or molecular signatures;**
- **Performing and documenting focused, targeted family history;**
- **Facilitating interdisciplinary and genetic referrals;**
- **Interpreting common and over-the-counter genetic tests (chromosomal, DNA, RNA, others);**

Nurses are critical to the Success of Precision Medicine and Precision Health

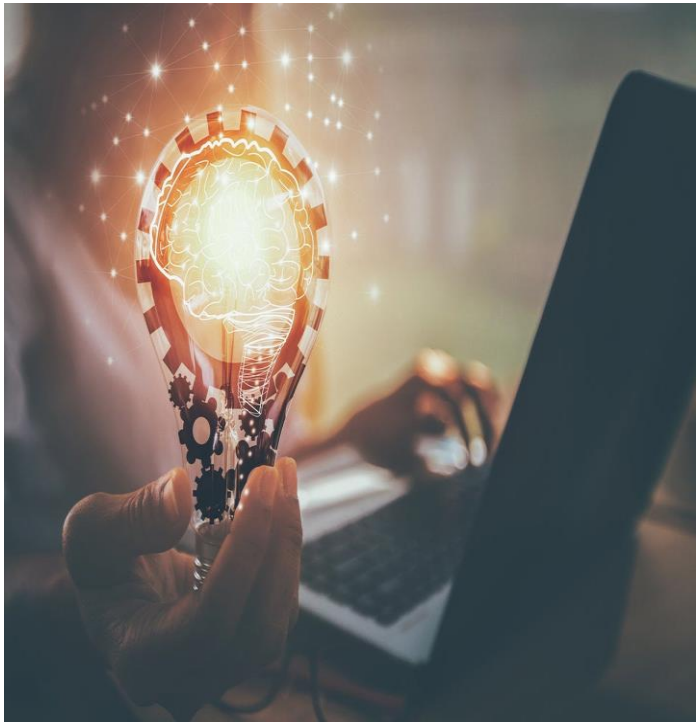
- Developing tailored care plans for, and providing education to patients, families, communities, and populations;
- Developing and optimizing staff, patient clinical workflows and processes.
- Coordinating care, interdisciplinary coordination, outreach and engagement into vulnerable and marginalized communities.

Innovation

Definition:

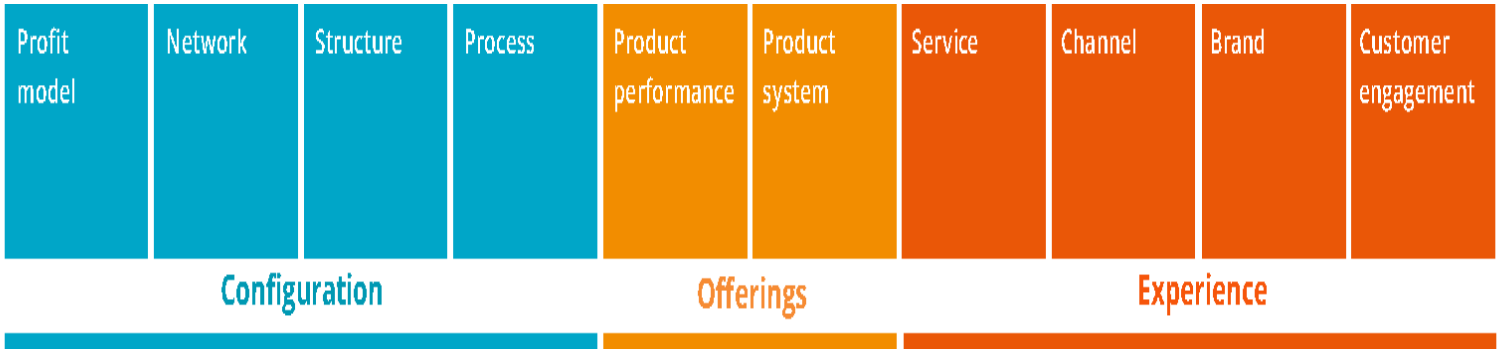
- Practical implementation of ideas that result in the introduction of new goods or services *OR* an improvement in the offering of goods and services.

- Successful implementation of a creative idea within an organization.



Innovation - Wikipedia

Multiple Innovation Types



True innovations that are truly novel have at least 5 of these factors, with at least 1 of the following:

- **Configuration**: Business model-centric innovations that configure assets differently to *capture* value;
- **Offerings**: Science and Technology platform-centric innovations that reinvents or recombines capabilities to *create* value;
- **Experience**: Human experience-centric innovations that engages customers differently to *deliver* value.

Innovating Internal Audit to Unlock Value - WSJ

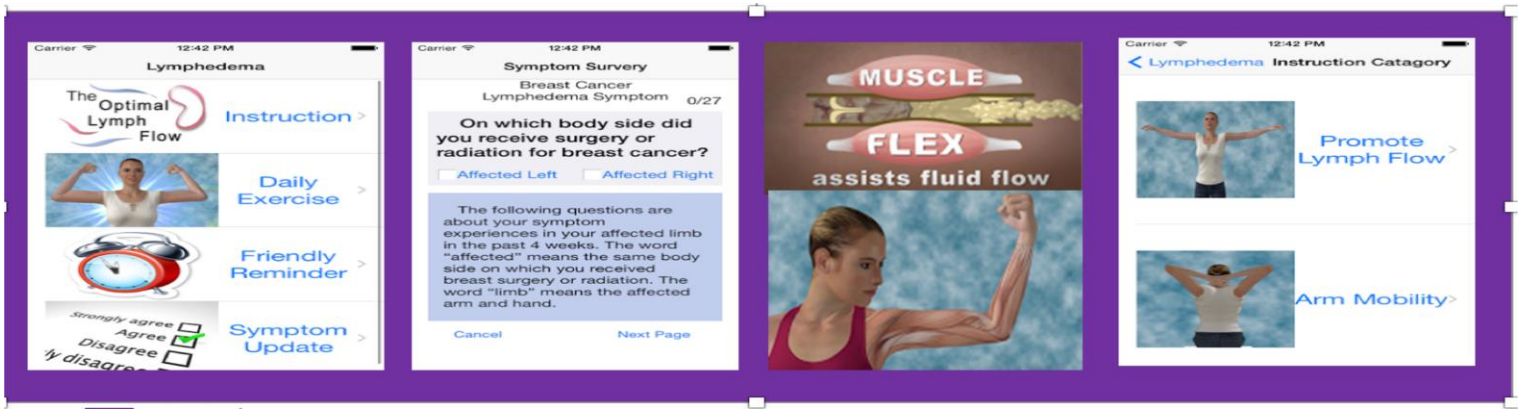
Innovation and Nursing

- **What if I am "Just a Nurse"?**
- **Harness available methods and tools to serve people better**
- **Create and produce things that are *good*, *true* and *beautiful*, by:**

  - **Step 1:** Assess the people involved, the problem and the possible solutions;
  - **Step 2:** Create a prototype, put it out there and test it. If you learn something and gain people's concrete reactions, this is a success regardless of whether it works on a longer-term basis or not;
  - **Step 3:** Moving on.

The-Optimal-Lymph-Flow Digital Therapy

The-Optimal-Lymph-Flow (TOLF) builds patients' self-management skills to promote lymph flow and results in complete pain reduction, reduced swelling and lymph fluid level, reversed mild lymphedema.



Nursing Research

- ✓ Symptom science
- ✓ Interventions that promote the best health outcomes given patients' particular omic, genetic/genomic, digital, lifestyle and environmental characteristics.
- ✓ Reliable and valid patient outcome measures to evaluate effective precision health implementation at the healthcare provider level, clinic level, hospital/facility level, and health system level.
- ✓ Ethical, legal, social implications research

Symptom Science

- The study of symptoms related to a disease or induced by treatment
- An essential component of the precision health's holistic understanding of disease phenotypes and the mechanism of symptoms.
- Omic associations with symptoms are key to the discovery of the underlying mechanisms of symptoms

- ***Subjective phenomenon***
- ***Indicates abnormal changes in body functioning or side effects from cancer treatment.***

Symptoms

- **Accumulation of lymph fluid in the interstitial spaces of the affected limb and areas**
- **Abnormality of or injuries to the lymphatic system**

Breast Cancer: Targets and Therapy

Dovepress

open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Symptom report in detecting breast cancer-related lymphedema

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Breast Cancer: Targets and Therapy
15 October 2015
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Deborah Axelrod[2,3]
Charles M Cleland[1]
Zeyuan Qiu[4]
Amber A Guth[2,3]
Robin Kleinman[2]
Joan Scagliola[2]
Judith Haber[1]

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Abstract: Breast cancer-related lymphedema is a syndrome of abnormal swelling coupled with multiple symptoms resulting from obstruction or disruption of the lymphatic system associated with cancer treatment. Research has demonstrated that with increased number of symptoms reported, breast cancer survivors' limb volume increased. Lymphedema symptoms in the affected limb may indicate a latent stage of lymphedema in which changes cannot be detected by objective measures. The latent stage of lymphedema may exist months or years before overt swelling occurs. Symptom report may play an important role in detecting lymphedema in clinical practice. The purposes of this study were to: 1) examine the validity, sensitivity, and specificity of symptoms for detecting breast cancer-related lymphedema and 2) determine the best clinical cutoff point for the count of symptoms that maximized the sum of sensitivity and specificity.

The following questions are about your experiences with movement on your affected body side today or in the past three month. The word "affected" means the same body side(s) on which you received breast surgery or radiation.

On which body side was your cancer treated?
☐Right ☐Left ☐Both

Do you have limited movement of your affected___?	**How Severe?**				
	No 0	A little 1	Somewhat 2	Quite a bit 3	Very Severe 4
1. shoulder					
2. elbow					
3. wrist					
4. fingers					

The following questions are about symptoms in your affected arm, hand, breast, axilla (under arm), or chest today or in the past three month.

Have you had ___?	**How Severe?**				
	No 0	A little 1	Somewhat 2	Quite a bit 3	Very Severe 4
5. swelling					
6. breast swelling					
7. chest wall swelling					
8. firmness					
9. tightness					
10. heaviness					
11. toughness or thickness of skin					
12. stiffness					
13. tenderness					
14. hotness/increased temperature					
15. redness					
16. blistering					
17. pain					
18. numbness					
19. burning					
20. stabbing					
21. tingling					
22. arm or hand fatigue					
23. arm or hand weakness					
24. pocket of fluid develop					

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The Breast

journal homepage: www.elsevier.com/brst

Original article

Precision assessment of heterogeneity of lymphedema phenotype, genotypes and risk prediction

Mei R. Fu [a, d, *], Yvette P. Conley [b], Deborah Axelrod [c, d], Amber A. Guth [c, d], Gary Yu [a], Jason Fletcher [a], David Zagzag [e]

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ABSTRACT

Lymphedema following breast cancer surgery is considered to be mainly due to the mechanical injury from surgery. Recent research identified that inflammation-infection and obesity may be the important predictors for lymphedema. The purpose of this exploratory research was to prospectively examine phenotype of arm lymphedema defined by limb volume and lymphedema symptoms in relation to inflammatory genes in women treated for breast cancer. A prospective, descriptive and repeated-measure design using candidate gene association method was used to enroll 140 women at pre-surgery and

Genotype Additive Models			
Genotypes	**Phenotype of Fluid Accumulation**		
IL6 rs1800795 IL4 rs2070874 IL4 rs2243250	**No Fluid Accumulation (< 2 Symptoms)**	**Fluid Accumulation (2 + Symptoms)**	**P = 0.005 OR (95% CI)**
0	**41/54; 75.9%**	**31/64; 48.4%**	**1.00**
1	**10/54; 18.5%**	**18/64; 28.1%**	**2.38 (0.89 – 6.59)**
2	**3/54; 5.6%**	**12/64; 18.8%**	**5.29 (1.25 – 31.13)**
3	**0/54; 0.0%**	**3/64; 4.7%**	**-----**
Genotypes	**Phenotype of Lymphatic Pain**		
VEGF-C rs3775203 IL13 rs1800925	**No Discomfort (< 2 Symptoms)**	**Discomfort (2 + Symptoms)**	**P = 0.022 OR (95% CI)**
0	**6/17; 35.3%**	**14/93; 15.0%**	**1.00**
1	**10/17; 58.8%**	**49/93; 52.7%**	**2.10 (0.53 – 7.73)**
2	**1/17; 5.9%**	**30/93; 32.3%**	**12.86 (1.30 – 610.42)**

Current Breast Cancer Reports
https://doi.org/10.1007/s12609-020-00397-6

LYMPHEDEMA INCIDENCE, PREVENTION AND TREATMENT (J ARMER, SECTION EDITOR)

Model-Based Patterns of Lymphedema Symptomatology: Phenotypic and Biomarker Characterization

Mei R. Fu[1,2] · Bradley E Aouizerat[3] · Gary Yu[4] · Yvette Conley[5] · Deborah Axelrod[6,7] · Amber A. Guth[6,7] · Jean-Pierre Gagner[8] · Jeanna M Qiu[9] · David Zagzag[10]

Accepted: 4 November 2020

Abstract

Purpose of the Study More than 50% of breast cancer survivors without a diagnosis of lymphedema suffer daily from numerous and co-occurring lymphedema symptoms. This study aimed to identify lymphedema symptom patterns and the association of such patterns with phenotypic characteristics and biomarkers using latent class analysis (LCA). A prospective, descriptive, and repeated-measure design was used to enroll 140 women and collect data.

Recent Findings LCA identified three distinct lymphedema symptom classes at 8 weeks and 12 months post-surgery: low, moderate, and severe symptom classes and associated phenotypic characteristics. Participants were more likely to be in the severe symptom classes at 12 months post-surgery if they had lower education level, cording, an axillary syndrome at 8 weeks post-surgery, neoadjuvant chemotherapy, and radiation.

Summary Pre-surgery level of IL1-a, IL-6, IL-8, and VEGF was associated with the severe symptom class at 8 weeks post-surgery, suggesting that such biomarkers may be used to predict risk for lymphedema symptoms.

Latent class analysis model				
Symptoms	**Average N=140**	**Low Risk n=55 (39%)**	**Moderate Risk n=62 (44%)**	**Severe Risk n=23 (16%)**
Limited Limb Mobility [a]				
Limited Shoulder Movement	30%	6%	38%	60%
Limited Elbow Movement	6%	0%	6%	17%
Limited Wrist Movement	7%	2%	2%	34%
Limited Arm Movement	28%	0%	33%	75%
Arm Firmness	16%	0%	17%	48%
Arm Tightness	44%	12%	58%	75%
Fibrosis	10%	2%	5%	43%
Arm Stiffness	35%	4%	44%	76%
Arm Hotness	8%	0%	0%	47%
Fluid Accumulation [a]				
Limited Fingers	7%	2%	3%	30%
Hand Swelling	16%	5%	10%	54%
Arm Swelling	23%	2%	19%	77%
Breast Swelling	30%	12%	38%	49%
Chest Wall Swelling	16%	2%	17%	42%
Numbness	43%	29%	44%	72%
Burning	10%	2%	7%	33%
Arm Heaviness	34%	0%	44%	80%
Pain/Discomfort [a]				
Tenderness	38%	2%	47%	92%
Blister	2%	0%	0%	9%
Pain, aching, or soreness	44%	12%	51%	96%
Stabbing	10%	0%	6%	38%
Tingling	38%	28%	36%	66%
Fatigue	22%	0%	27%	56%
Arm Weakness	29%	4%	32%	77%
Seroma, pocket of fluid	10%	0%	7%	40%
Redness	4%	0%	3%	17%
Symptom Count	5.460	1.162	5.948	14.013

Symptoms & Microbiome

frontiers in Cellular and Infection Microbiology

ORIGINAL RESEARCH
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Check for updates

Study on the Salivary Microbial Alteration of Men With Head and Neck Cancer and Its Relationship With Symptoms in Southwest China

Hao-Jiang Zuo[1,2†], Mei R. Fu[3†], Hui-Ling Zhao[1], Xin-Wen Du[1], Zi-Yi Hu[1], Xun-Ying Zhao[2], Xiao-Qin Ji[1], Xian-Qiong Feng[1], Wuerken Zhumajiang[2,4], Ting-Hui Zhou[5], Ya-Li Tian[1], Xiao-Fang Pei[2], Rong Yu[1] and Xiu-Ying Hu[1,6*]*

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This study explored the association between oral microbes and head and neck cancer (HNC) as well as symptoms related to patients with HNC before surgical treatment. Fifty-six patients with HNC and 64 matched healthy controls were recruited from West China hospital in Southwest China. The demographic, clinical, and symptom data were collected. Salivary samples were collected to determine the microbial characteristics using 16S rRNA gene sequencing. Patients with HNC presented increased *Capnocytophaga* abundances. The oral microbial markers as *Capnocytophaga* (area

- Using Capnocytophaga and symptom of voice/speech difficulty achieved an overall predicting accuracy of 92.5% comparing with using Capnocytophaga alone (79.2% accuracy) to detect patients with HNC.

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ORIGINAL ARTICLE

Observational Study

Oral microbiome and pancreatic cancer

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Author contributions: Li A and Fu MR contributed equally to this work; Fu MR, Li A, Wei AL, Hu WM, and Li K designed the study; Wei AL, Fu MR, and Zhou LL were responsible for the methodology and development stages of the manuscript; Wang X and Li GQ collected samples; Li M, Yuan J, Li ZL, Liu HY, and Wei AL obtained and analyzed the clinical data; Wei AL and Fu MR wrote a draft; All authors wrote the manuscript.

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Abstract

BACKGROUND

Microbiota profiles differ between patients with pancreatic cancer and healthy people, and understanding these differences may help in early detection of pancreatic cancer. Saliva sampling is an easy and cost-effective way to determine microbiota profiles compared to fecal and tissue sample collection.

AIM

To investigate the saliva microbiome distribution in patients with pancreatic adenocarcinoma (PDAC) and the role of oral microbiota profiles in detection and risk prediction of pancreatic cancer.

METHODS

We conducted a prospective study of patients with pancreatic cancer (n = 41) and healthy individuals (n = 69). Bacterial taxa were identified by 16S ribosomal ribonucleic acid gene sequencing, and a linear discriminant analysis effect size algorithm was used to identify differences in taxa. Operational taxonomic unit values of all selected taxa were converted into a normalized Z-score, and logistic

- Carriage of Streptococcus and Leptotrichina was associated with a higher risk of PDAC [OR= 5.344, OR = 6.886).
- Veillonella and Neisseria were protective microbe that decreased the risk of PDAC (OR = 0.187, and OR = 0.309).
- Symptomatic patients had different bacteria profiles than asymptomatic patients.
- Combined symptom and microbiome evaluation may help in the early detection of pancreatic cancer.

Nursing Education

- ✓ Integration of precision health concepts, skills, and matrices into all levels of nursing education as recommended by national and international nursing consensus framework statements;
- ✓ Increased precision health content for continuing education and training programs; incorporation of genomics in entry-level RN licensure exams;
- ✓ Support use of and participation in international education frameworks devoted to precision health.

Student Survey Comments
Mei's enthusiasm for genetics is infectious and made me very excited to learn more about gene's and genetic contents. I thoroughly enjoyed this class, thanks Mei
This has been an excellent course. Dr. Fu's enthusiasm for the material really enhanced my learning. Before taking the course, I really thought it was odd that NYU's DNP program required this genetics and genomics class. However, after going through the course, I can really appreciate why it has been required. We need to be proficient in this area to elevate the profession of nursing.

Genetics and Genomics for Health Care

Nursing Practice

- *Implementation of precision health interventions* (i.e., pharmacogenetics/genomics, 3-generation family health history, genetic testing);
- Support of baccalaureate and advanced practice nurses to pursue genomics certification as a specialty;
- Design and optimization of clinical care workflows that ensure patient safety and healthcare quality;
- Adequate nursing workforce labor supply, skill preparation for Genetic/Genomic use.

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Machine learning for detection of lymphedema among breast cancer survivors

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Background: In the digital era when mHealth has emerged as an important venue for health care, the application of computer science, such as machine learning, has proven to be a powerful tool for health care in detecting or predicting various medical conditions by providing improved accuracy over conventional statistical or expert-based systems. Symptoms are often indicators for abnormal changes in body functioning due to illness or side effects from medical treatment. Real-time symptom report refers to the report of symptoms that patients are experiencing at the time of reporting. The use of machine learning integrating real-time patient-centered symptom report and real-time clinical analytics to develop real-time precision prediction may improve early detection of lymphedema and long term clinical decision support for breast cancer survivors who face lifelong risk of lymphedema. Lymphedema, which is associated with more than 20 distressing symptoms, is one of the most distressing and dreaded late adverse effects from breast cancer treatment. Currently there is no cure for lymphedema, but early detection can help patients to receive timely intervention to effectively manage lymphedema. Because lymphedema can occur immediately after cancer surgery or as late as 20 years after surgery, real-time detection of lymphedema using machine learning is

Nursing Administration

- ✓ Support of Precision Health Collaborations, Nursing Research and Scientific Training w/Multi-sector partners;
- ✓ Education of Boards and administrators as to the strategic value and importance of Precision Health; advances in to promote high quality and innovative health care;
- ✓ Develop policies that support safe Precision Health integration into routine health care operations; use of Precision Health models and frameworks to guide strategic planning; active use of and support for nurse leaders who are experts in Precision Health; synergize w/Magnet credentialing requirements;
- ✓ Protection of patients, families, and employees' genetic information (HIPAA, GINA); linkage of Precision Health nursing practice interventions to 3rd party multi-payor collaborations (i.e., Electronic Health Record documentation, family health history).

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Nursing Policy

- ✓ Nurse leader representation on interdisciplinary and multi-sector collaborative strategic committees, consortiums, or events to advance Precision Health; Local community to international
- ✓ Development of policy solutions support modernization and innovation in health care systems
- ✓ Use of multi-level policy levers to support Precision Health systems, research, and training for nurse executives and leaders within health care systems to be competent to harness Precision Health Science/Technology advances;
- ✓ Genetic Tests: expand multidisciplinary collaborations and referral networks; ensure regulatory compliance;
- ✓ Prioritization of strategic EBP, QI and performance improvement initiatives as a policy driver; workforce for under-resourced local/regional networks.

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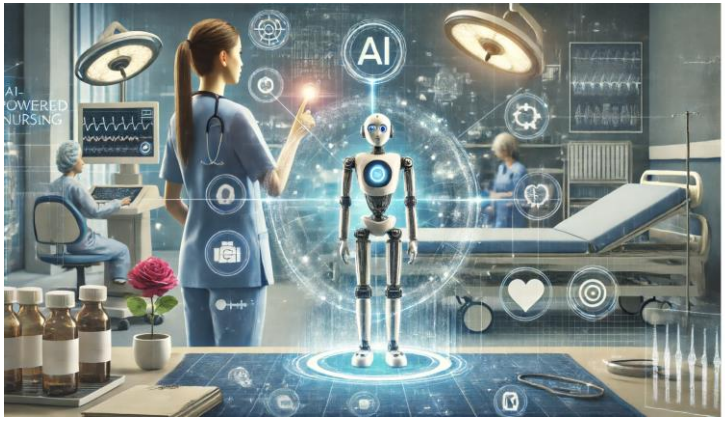
Precision Health/Nursing

- The right patient
- The right treatment
- The right route
- The right dosage
- The right time



Thank you!

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